

FIG. 1

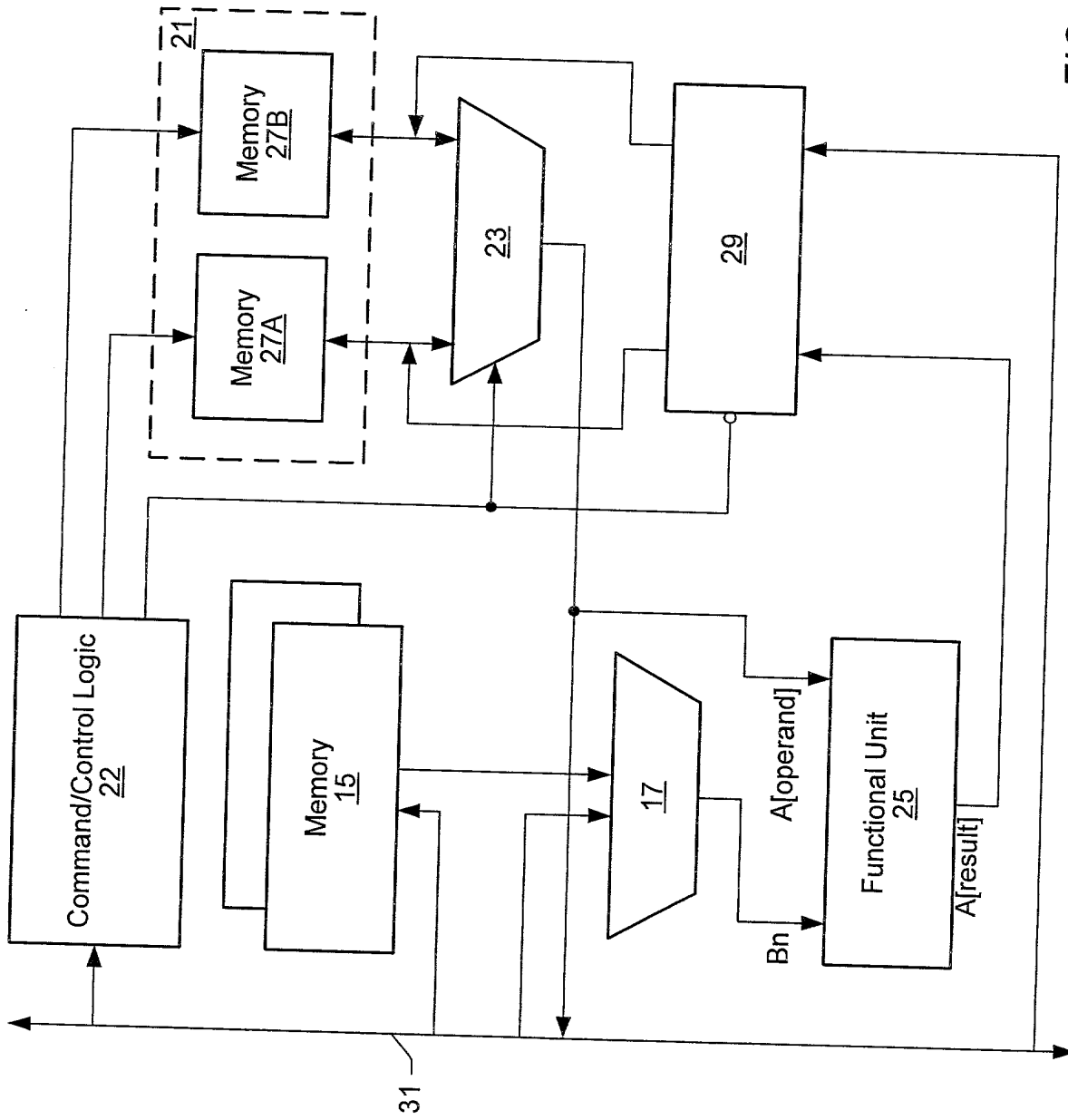
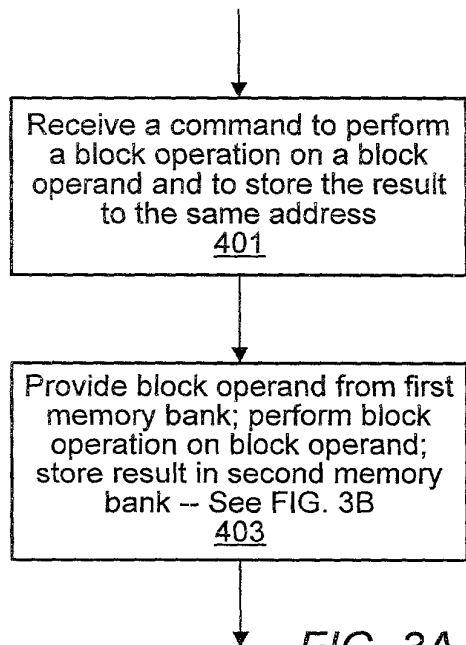


FIG. 2



**FIG. 3A**

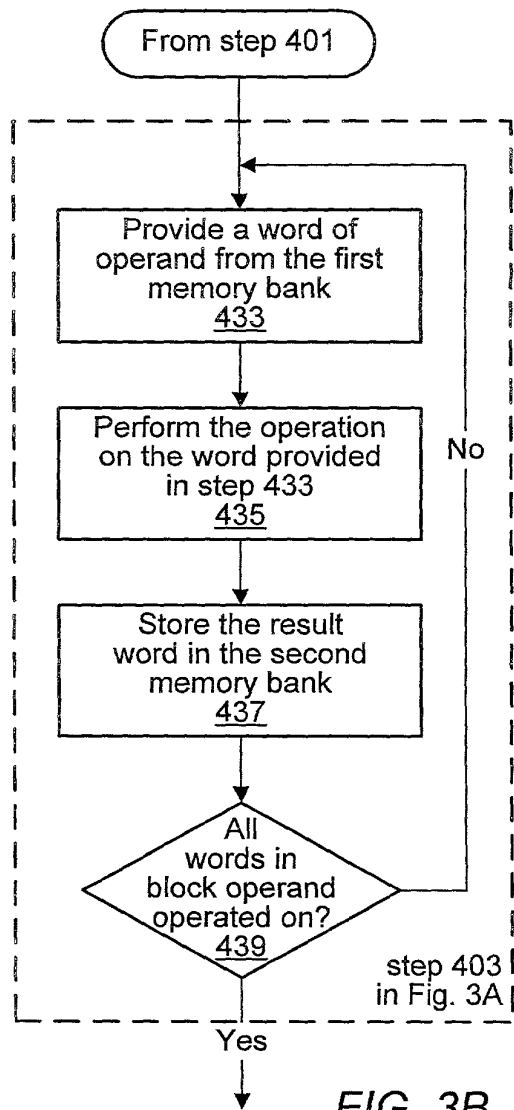
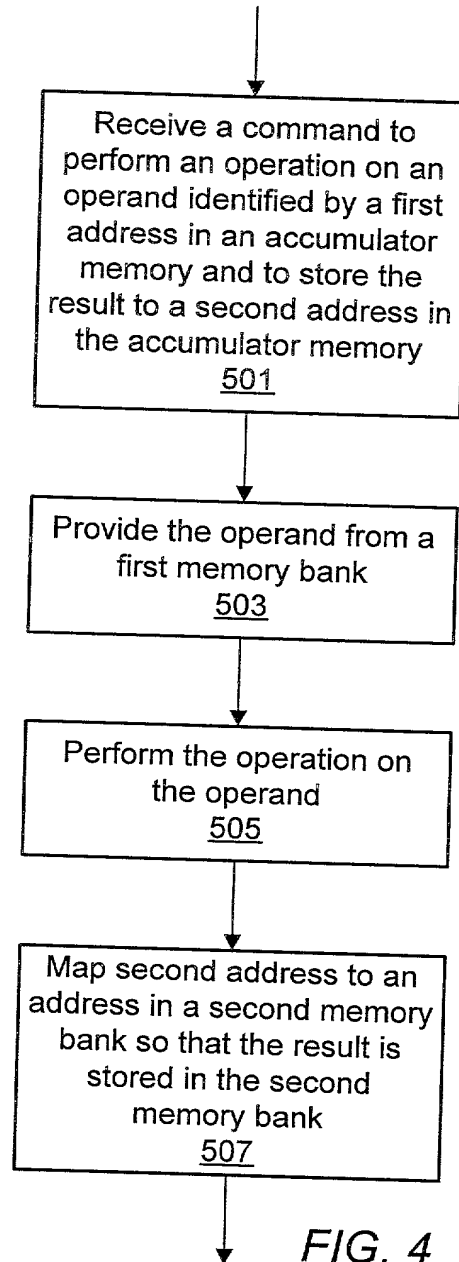


FIG. 3B



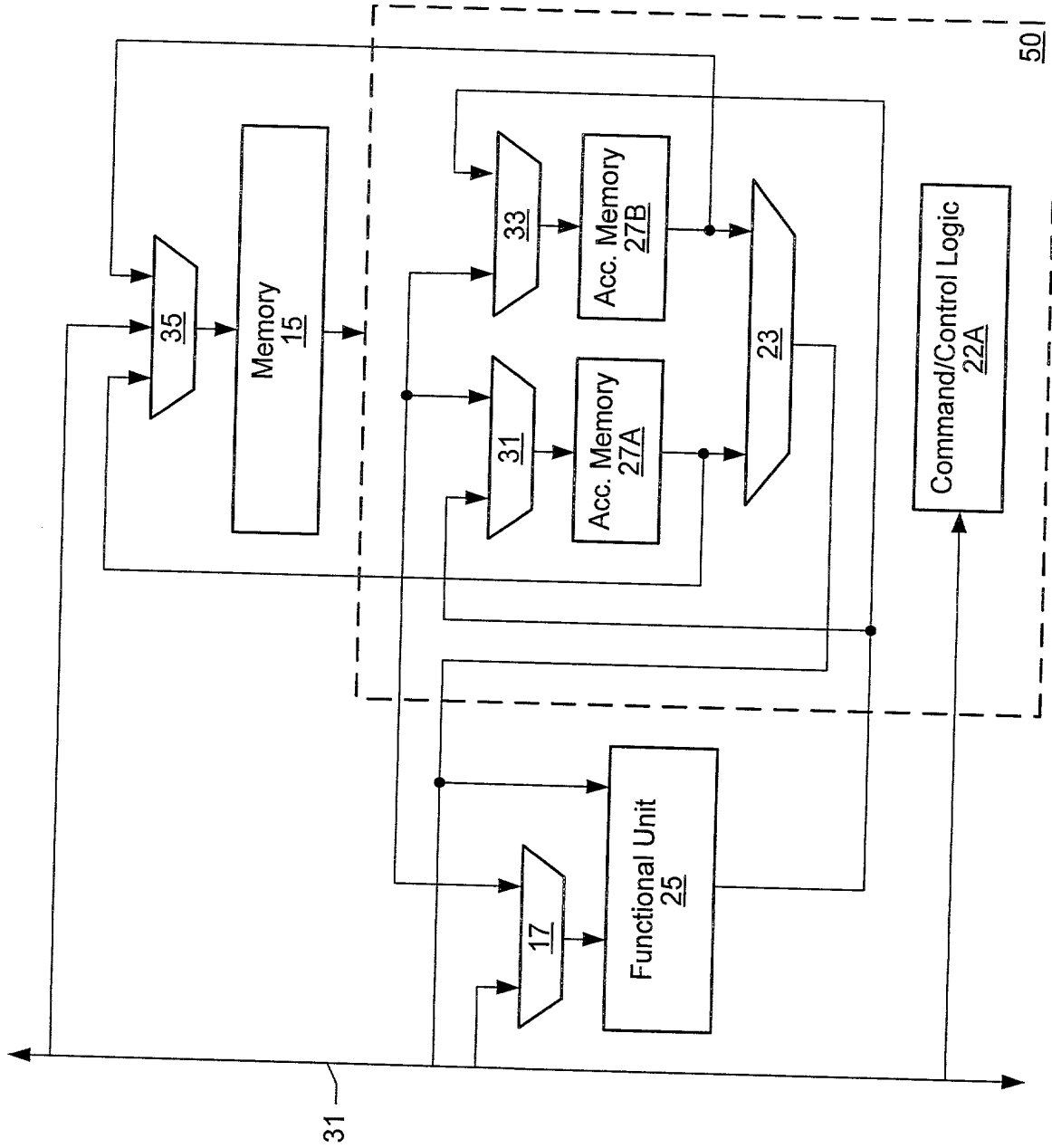


FIG. 5

Instructions	Acc. Memory <u>27A</u>	Acc. Memory <u>27B</u>	Memory <u>15</u>
B = B0	B(new)	n/a	B0
B = B XOR B1	B(old)	B(new)	B1
B = B XOR B2	B(new)	B(old)	B2
B = B XOR B3	B(old)	B(new)	B3
B = B XOR B4	B(new)	B(old)	B4
flush cache	n/a	n/a	B

FIG. 6

Instructions	Acc. Memory <u>27A</u>	Acc. Memory <u>27B</u>	Memory <u>15</u>
B = immed(B0)	B(new)	n/a	n/a
B = B XOR immed(B1)	B(old)	B(new)	n/a
B = B XOR immed(B2)	B(new)	B(old)	n/a
B = B XOR immed(B3)	B(old)	B(new)	n/a
B = B XOR immed(B4)	B(new)	B(old)	n/a
flush cache	n/a	n/a	B

FIG. 7

Accumulation Operations:

$B = B_0 \text{ XOR } B_1 \text{ XOR } B_2 \text{ XOR } B_3 \text{ XOR } B_4$   
 $C = C_0 \text{ XOR } C_1 \text{ XOR } C_2 \text{ XOR } C_3 \text{ XOR } C_4$   
 $D = D_0 \text{ XOR } D_1 \text{ XOR } D_2 \text{ XOR } D_3 \text{ XOR } D_4$

Instructions:

- (1)  $B = B_0$
- (2)  $B = B \text{ XOR } B_1$
- (3)  $B = B \text{ XOR } B_2$
- (4)  $C = C_0$
- (5)  $C = C \text{ XOR } C_1$
- (6)  $C = C \text{ XOR } C_2$
- (7)  $B = B \text{ XOR } B_3$
- (8)  $D = D_0$
- (9)  $D = D \text{ XOR } D_1$
- (10)  $D = D \text{ XOR } D_2$
- (11)  $C = C \text{ XOR } C_3$
- (12)  $D = D \text{ XOR } D_3$
- (13)  $B = B \text{ XOR } B_4$
- (14)  $C = C \text{ XOR } C_4$
- (15)  $D = D \text{ XOR } D_4$

*FIG. 8A*



Row#	Instructions/Operations	Acc. Memory <u>27A</u>	Acc. Memory <u>27B</u>	Memory <u>15</u>
1	(1) B = B0	B(new)	n/a	B0
2	(2) B = B XOR B1	B(old)	B(new)	B1
3	(3) B = B XOR B2	B(new)	B(old)	B2
4	(4) C = C0	C(new)	n/a	C0
5	(5) C = C XOR C1	C(old)	C(new)	C1
6	(6) C = C XOR C2	C(new)	C(old)	C2
7	(7) B = B XOR B3	B(old)	B(new)	B3
8	(8) D = D0	n/a	n/a	n/a
9	(8) flush C	C	n/a	C
10	(8) load D	D(new)	n/a	D0
11	(9) D = D XOR D1	D(old)	D(new)	D1
12	(10) D = D XOR D2	D(new)	D(old)	D2
13	(11) C = C XOR C3	n/a	n/a	n/a
14	(11) flush B	n/a	B	B
15	(11) load C	n/a	C(new)	C
16	(11 completes)	C(new)	C(old)	C3
17	(12) D = D XOR D3	D(old)	D(new)	D3
18	(13) B = B XOR B4	n/a	n/a	n/a
19	(13) flush C	C	n/a	C
20	(13) load B	B(new)	n/a	B
21	(13 completes)	B(old)	B(new)	B4
22	flush B	n/a	B	B
23	(14) C = C XOR C4	n/a	n/a	n/a
24	(14) load C	n/a	C(new)	C
25	(14 completes)	C(new)	C(old)	C4
26	flush C	C	n/a	C
27	(15) D = D XOR D4	D(new)	D(old)	D4
28	flush cache	D	n/a	D

FIG. 8B

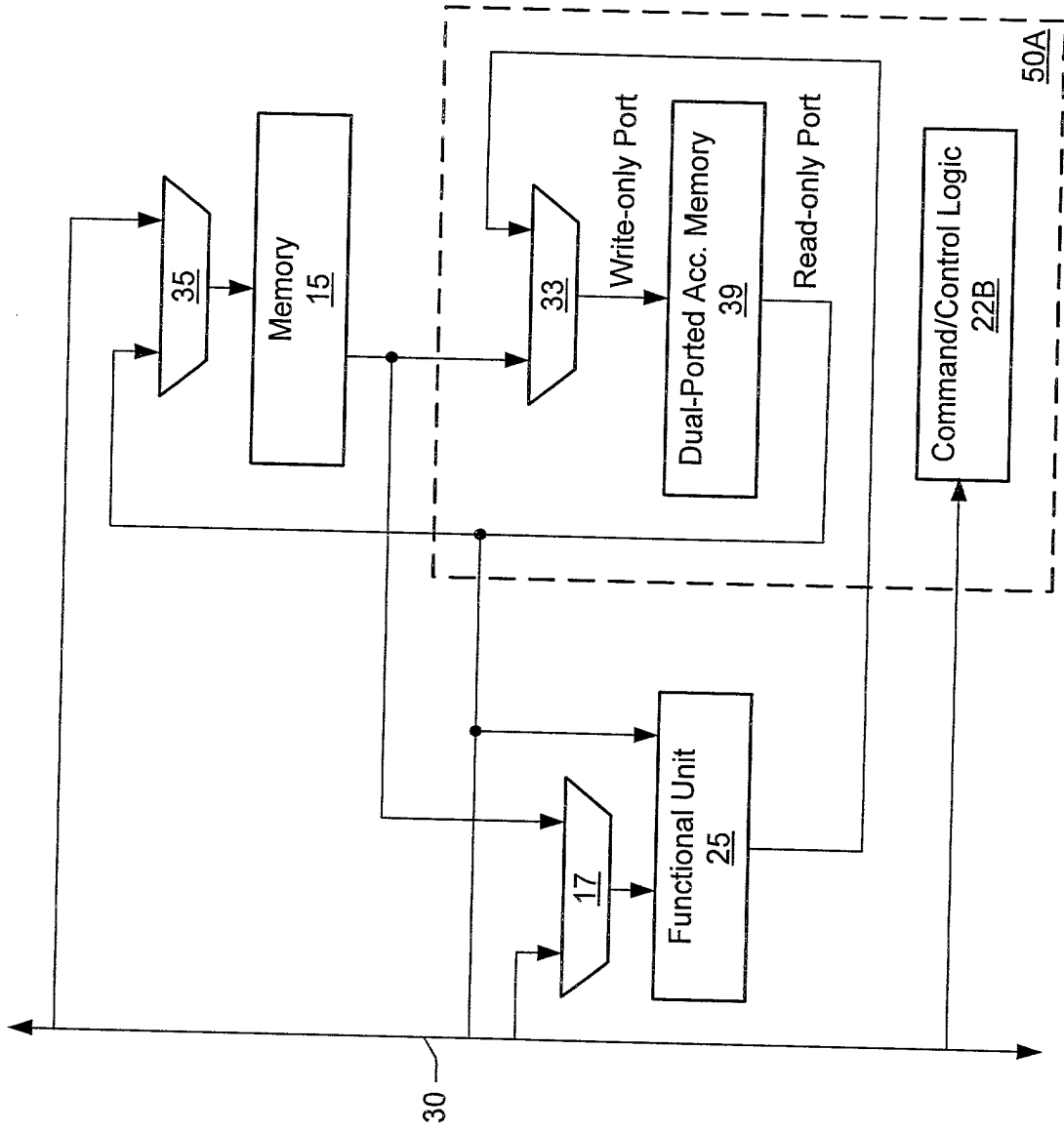
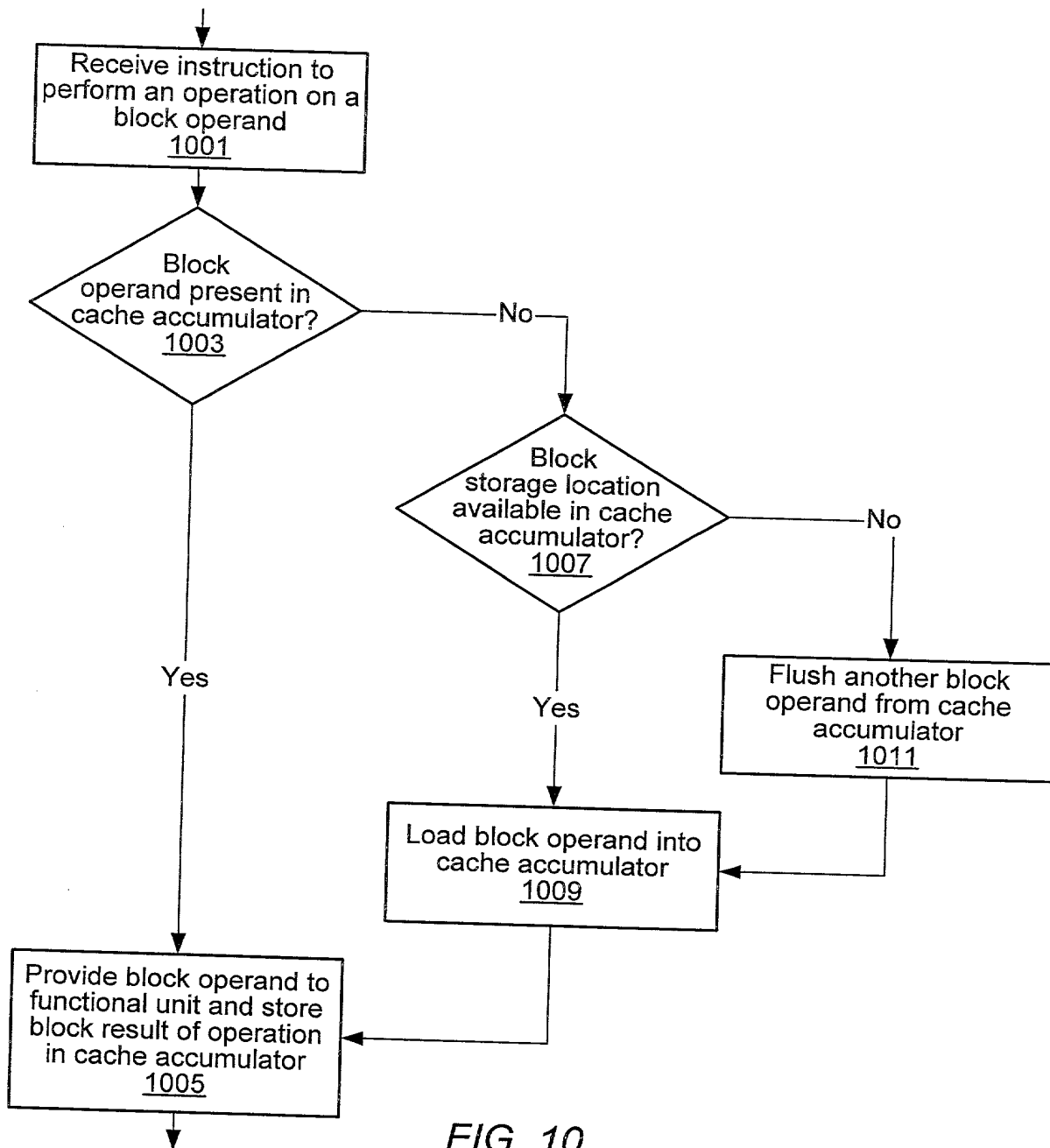


FIG. 9



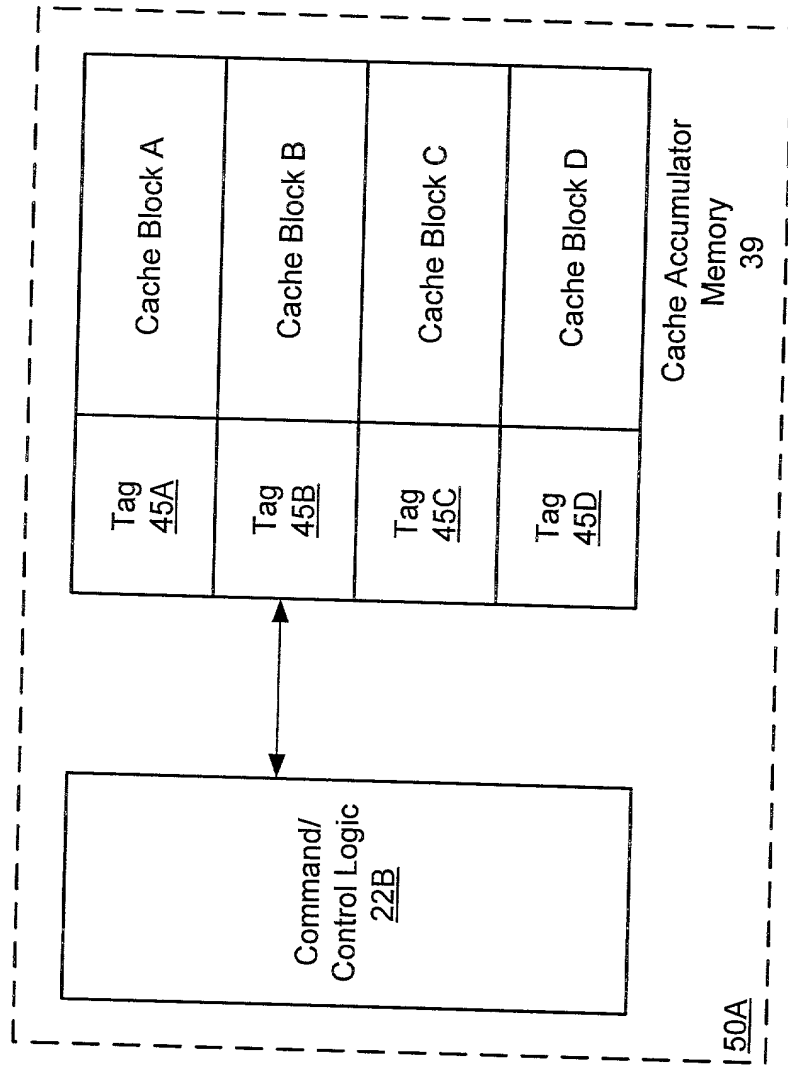


FIG. 11A

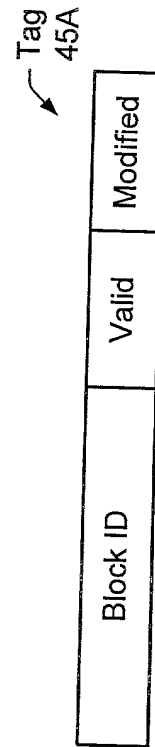


FIG. 11B

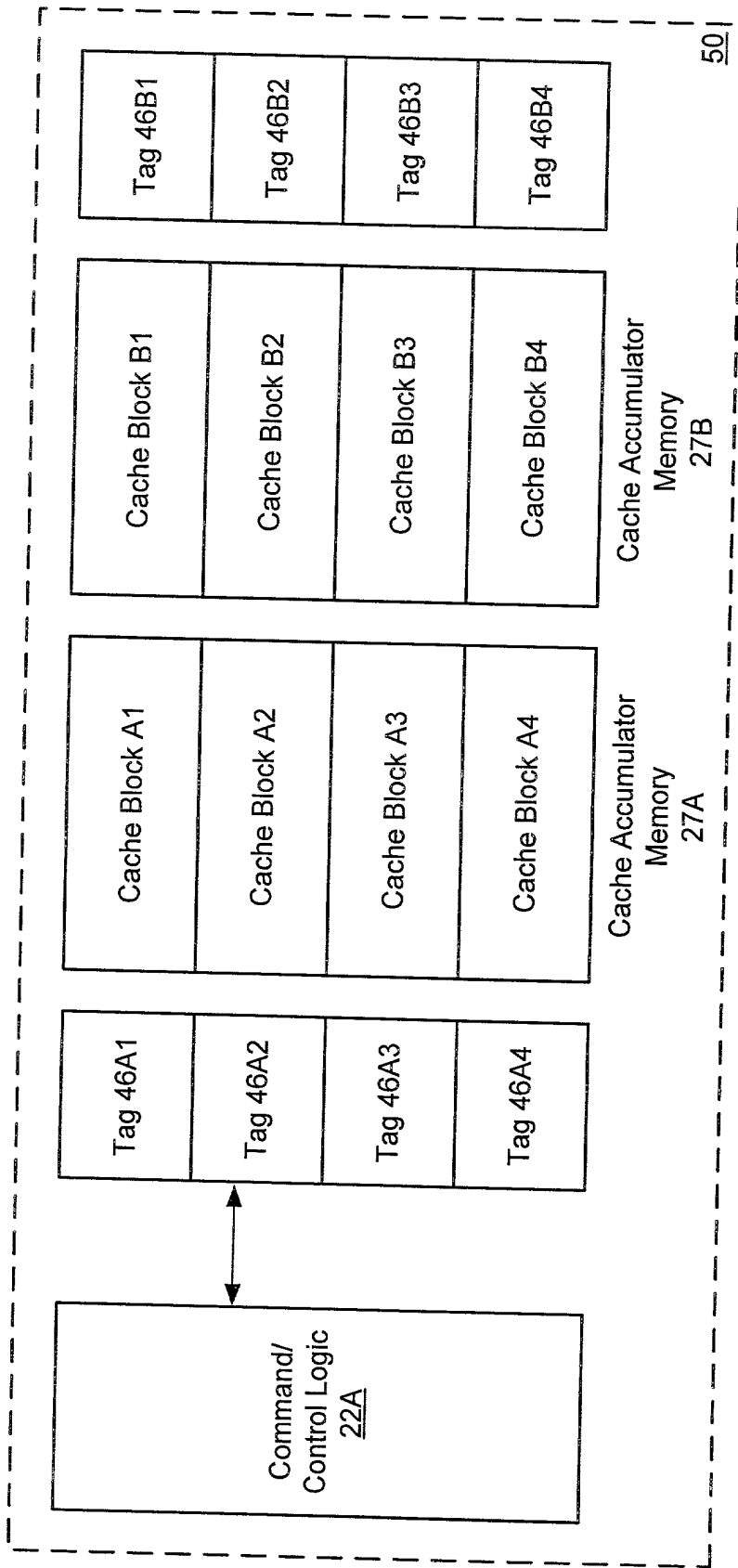


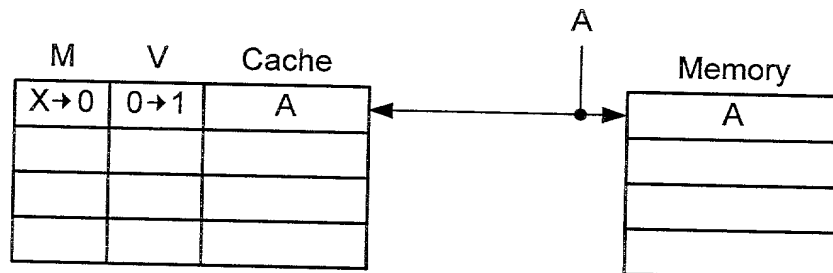
FIG. 12A

Tag 46A1

Block ID	Valid	Modified	Bank
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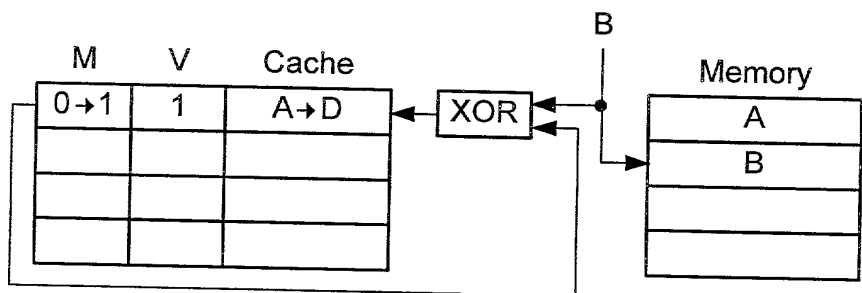
FIG. 12B

Accumulation Operation:  
 $D = A \text{ XOR } B \text{ XOR } C$



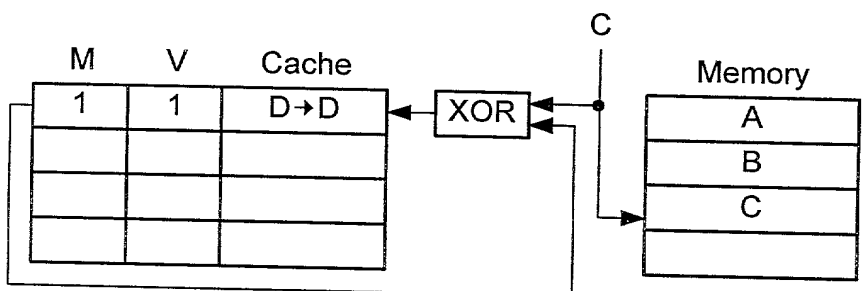
Instruction 1:  
 Write\_Allocate(A)

FIG. 13A



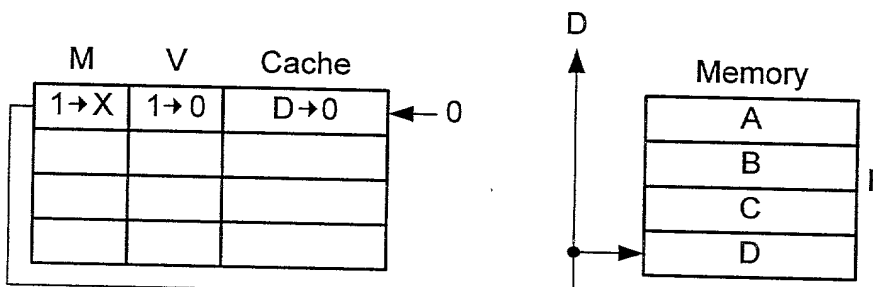
Instruction 2:  
 XOR\_Write(A,B,D)

FIG. 13B



Instruction 3:  
 XOR\_Write(D,C,D)

FIG. 13C

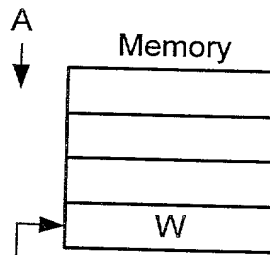


Instruction 4:  
 Read\_Deallocate(D)

FIG. 13D

Accumulation Operation:  
 $D = A \text{ XOR } B \text{ XOR } C$

M	V	Cache
1→X	1→0	W→0 ← 0
1	1	X
1	1	Y
1	1	Z



Instruction 1:  
 Write\_Allocate(A)

All block storage locations  
 are allocated; W is flushed  
 to memory

FIG. 14A

M	V	Cache
X→0	0→1	A
1	1	X
1	1	Y
1	1	Z

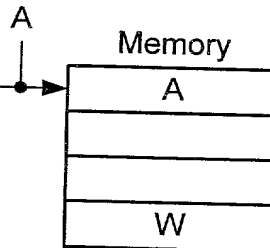
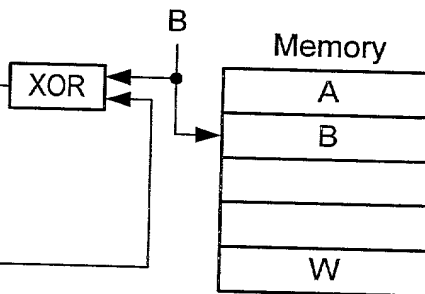


FIG. 14B

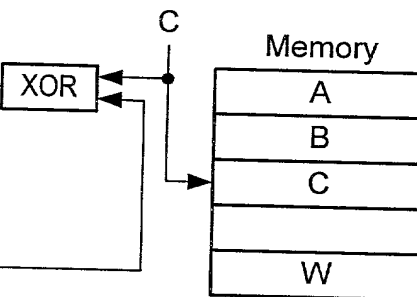
M	V	Cache
0→1	1	A→D
1	1	X
1	1	Y
1	1	Z



Instruction 2:  
 XOR\_Write(A,B,D)

FIG. 14C

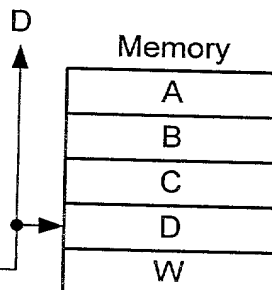
M	V	Cache
1	1	D→D
1	1	X
1	1	Y
1	1	Z



Instruction 3:  
 XOR\_Write(D,C,D)

FIG. 14D

M	V	Cache
1→X	1→0	D→0 ← 0
1	1	X
1	1	Y
1	1	Z



Instruction 4:  
 Read\_Deallocate(D)

FIG. 14E

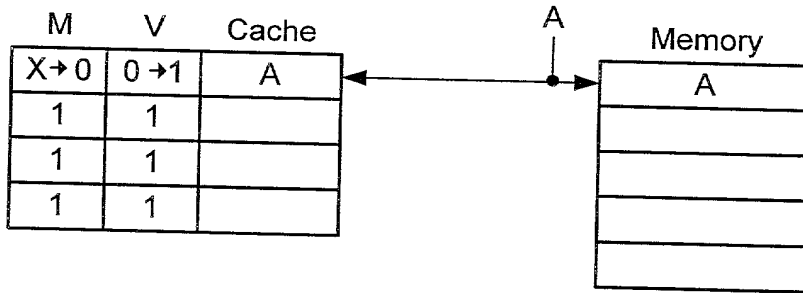


FIG. 15A

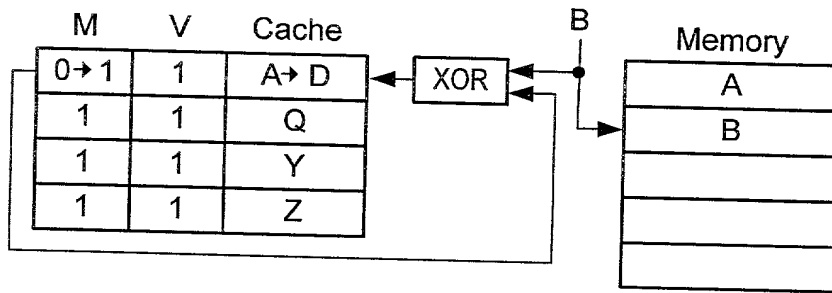


FIG. 15B

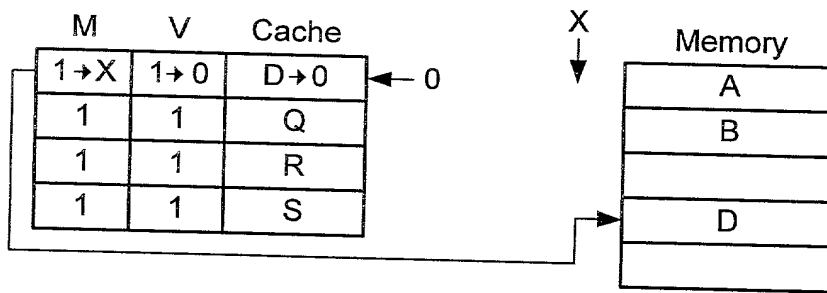


FIG. 15C

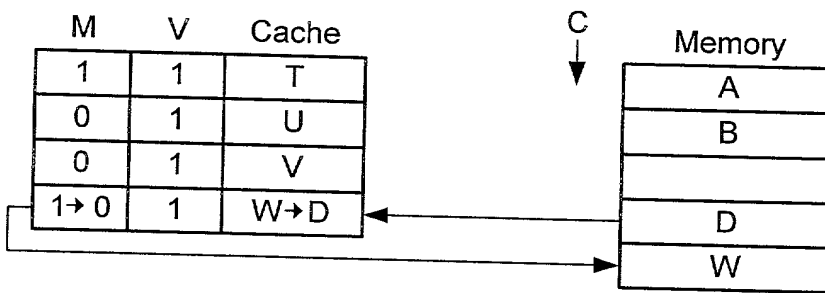


FIG. 15D

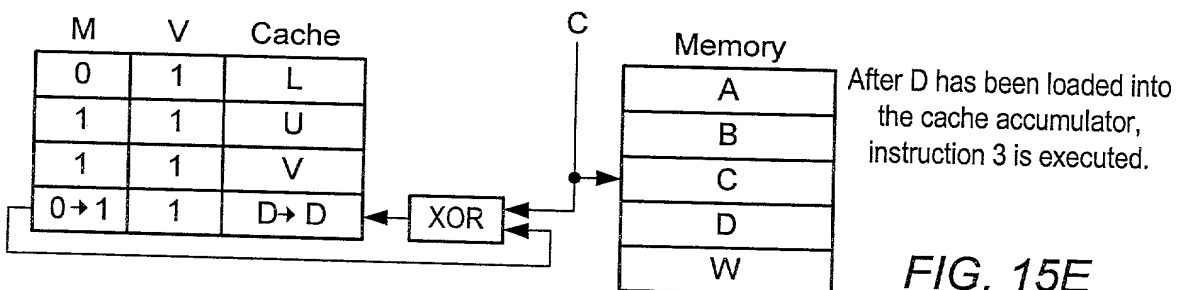
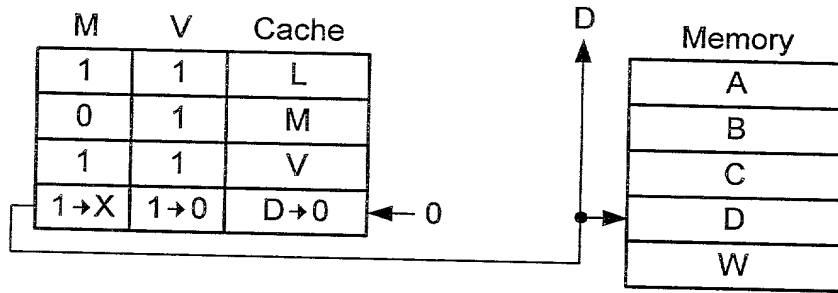


FIG. 15E

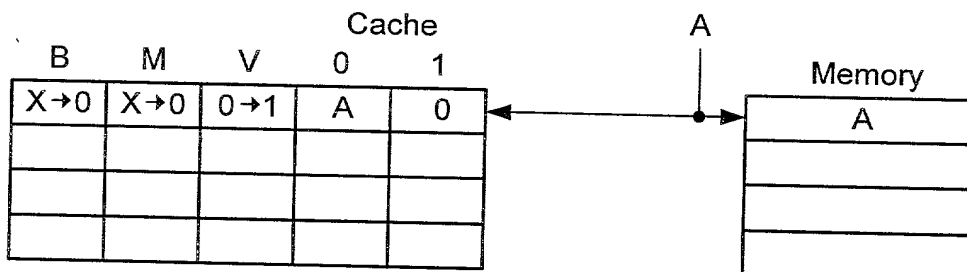




Instruction 4:  
Read\_Deallocate(D)

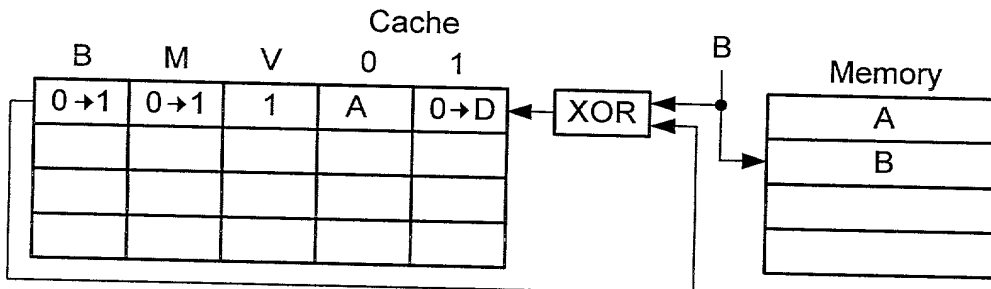
FIG. 15F

Accumulation Operation:  
 $D = A \text{ XOR } B \text{ XOR } C$



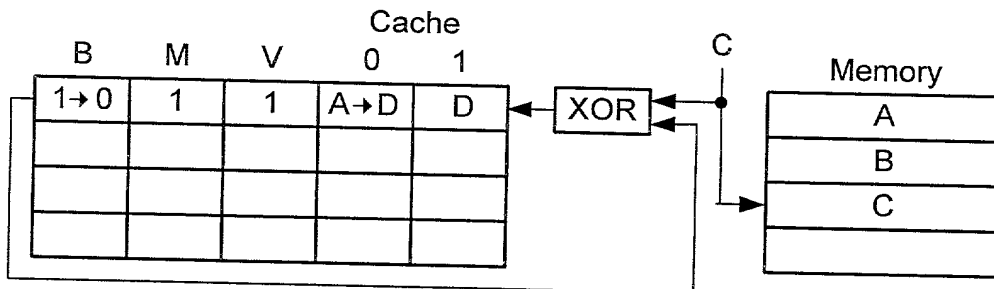
Instruction 1:  
Write\_Allocate(A)

FIG. 16A



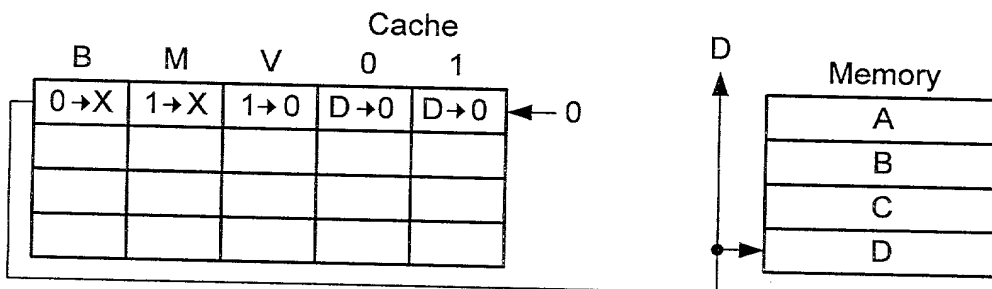
Instruction 2:  
XOR\_Write(A,B,D)

FIG. 16B



Instruction 3:  
XOR\_Write(D,C,D)

FIG. 16C



Instruction 4:  
Read\_Deallocate(D)

FIG. 16D

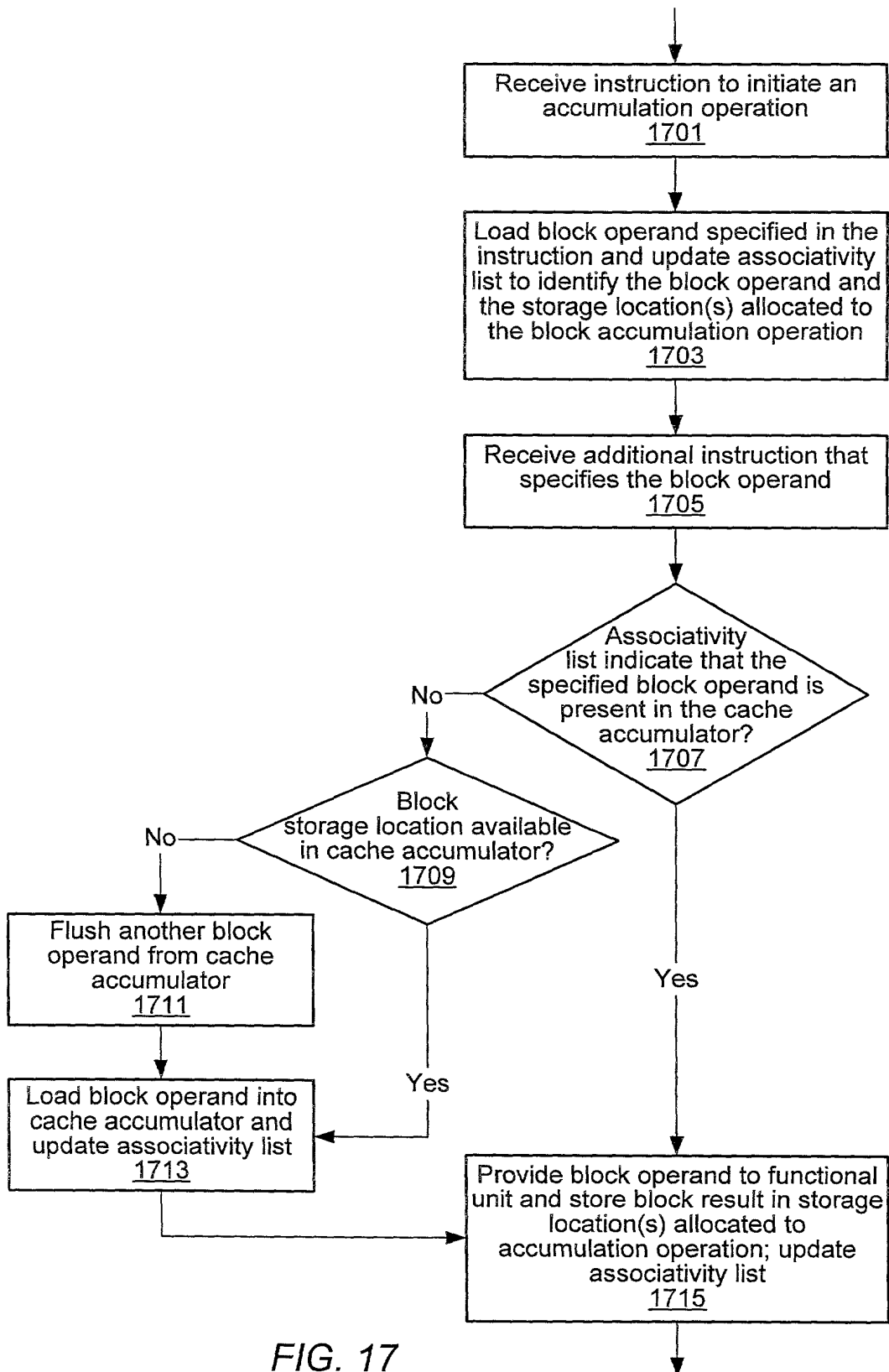


FIG. 17